A view on Infrastructure Standards: ISO/ IEC, ANSI/TIA and ANSI/BICSI What are their relationships and where are we heading?

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IEEE for Ethernet

IEEE 802:
LAN / Man Standards

802.5: Token Ring (disbanded)

802.1: Higher LAN Protocols

802.15: WPAN (bluetooth, Zigbee,...)

IEEE 802: LAN / MAN standards

802.3 Ethernet (CSMA / CD)	**802.11 Wireless (CSMA / CA)**
802.3j (1990) 10base-T, 10base-F	**802.11a (1999)** 54Mbps @ 5GHz
802.3u (1995) 100base-TX, 100base-T4, 100base-FX	**802.11b (1999** 11Mbps @ 2.4GHz
802.3z (1998) 1000base-X (Fiber optic)	**802.11g (2003** 54Mbps @ 2.4GHz
802.3ab (1999) 1000base-T	**802.11n (2012)** 150Mbps @ 2.4 and 5GHz, 600M w/MIMO 4
802.3ae (2003) 10G on fiber	**802.11ac (2012)** 867Mbps @ 5GHz , 6.77G w/ MIMO 8
802.3af (2003) Power over Ethernet, 15w	**802.11ad (2013)** 6.75Gbps @ 2.4, 5, and 60GHz
802.3an (2006) 10Gbase-T	**802.11ax (2019?)** improvement of 802.11ac for high density
802.3at "PoE+" 30W	
802.3ba (2010) 40G and 100G on fiber	

ISO, International

Components

ISO Information Technology Generic Cabling Systems

Performance, Design	Implementation	Validation
ISO/IEC 11801-1 (2017) General requirements	**ISO/IEC 14763-2** Planning and Installation Implementation	**ISO/IEC 61935-1** Testing of balanced twisted Pair Cabling
ISO/IEC 11801-2 (2017) Offices and commercial buildings		**ISO/IEC 14763-3** Testing of Fiber Optic Cabling
ISO/IEC 11801-3 (2017) Industrial premises		
ISO/IEC 11801-4 (2017) Homes		
ISO/IEC 11801-5 (2017) Data centers		
ISO/IEC 11801-6 (2017) Distributed building services		
ISO/IEC TR 24750 (2007) Assessment and mitigation of installed balanced cabling channels in order to support of 10GBASE-T		
ISO/IEC TR 24704 (2004) Cabling for wireless access points		

CENELEC, European

CENELEC Information Technology Generic Cabling Systems

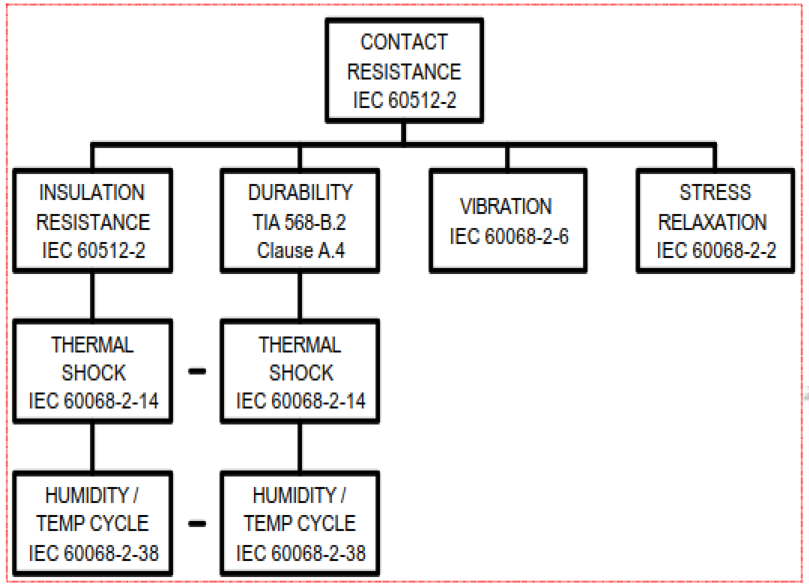
Components	Performance, Design	Implementation	Validation
	CENELEC EN50173-1 General Requirements	**CENELEC EN50174-1** Specification and quality assurance	**CENELEC EN50346** Testing of installed cabling
	CENELEC EN50173-2 Office premises	**CENELEC EN50174-2** Installation planning and practices	
	CENELEC EN50173-3 Industrial premises	**CENELEC EN50174-3** Planning and Installation	
	CENELEC EN50173-4 Homes		
	CENELEC EN50173-5 Data centers		
	CENELEC EN50173-6 Distributed Building Services		

TIA, North American

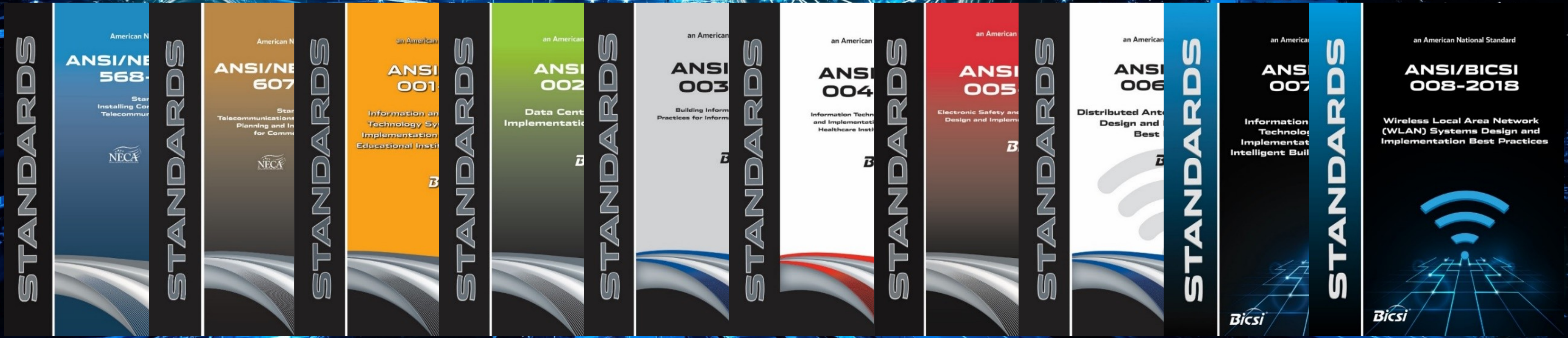
ANSI/TIA: Telecommunications Cabling for Customer Premises

Components, Performance	Design	Implementation	Validation
TIA - 568.2-D Balanced twisted-pair cabling	**TIA - 568.0-D** Generic cabling	**TIA - 569-D** Telecommunications pathways and spaces	**TIA - 526-7-A** Single-mode fibre testing
TIA - 568.3-D Optical fibre cabling	**TIA - 568.1-D** Commercial building	**TIA - 607-C** Bonding and grounding telecommunications	**TIA - 536- 14-C** Multi-mode fibre testing
TIA - 568.4-D Broadband coaxial cabling and components	**TIA - 758-B** Customer-owned outside plant	**TIA - 606-C** Administration	**TIA - TSB-155-A** Support of 10Gbase-T on eixiting Cat.6
	TIA - 942-B Data centers	**TIA - 862-B** Intelligent building systems	**TIA - TSB-5021** Guidelines for 2.5G and 5G on Cat5e and Cat6
	TIA - 1005-A Industrial premises	**TIA - 5017** Physical network security	
	TIA - 1179-A Healthcare facilities		
	TIA - 570-C Residential		
	TIA - 4966 Educational facilities		
	TIA - 162-A Cabling for wireless access points		

International Electrotechnical Commission



BICSI Publications - Standards



BICSI International Standards Program

- Develop standards within all facets of Information & Communications Technology (ICT) infrastructure design and installation

- Details:
  - Over 500 members worldwide
  - Accredited by ANSI
  - Develops international standards and best practices
  - Nonprofit program - free of financial influences

www.bicsi.org/standards

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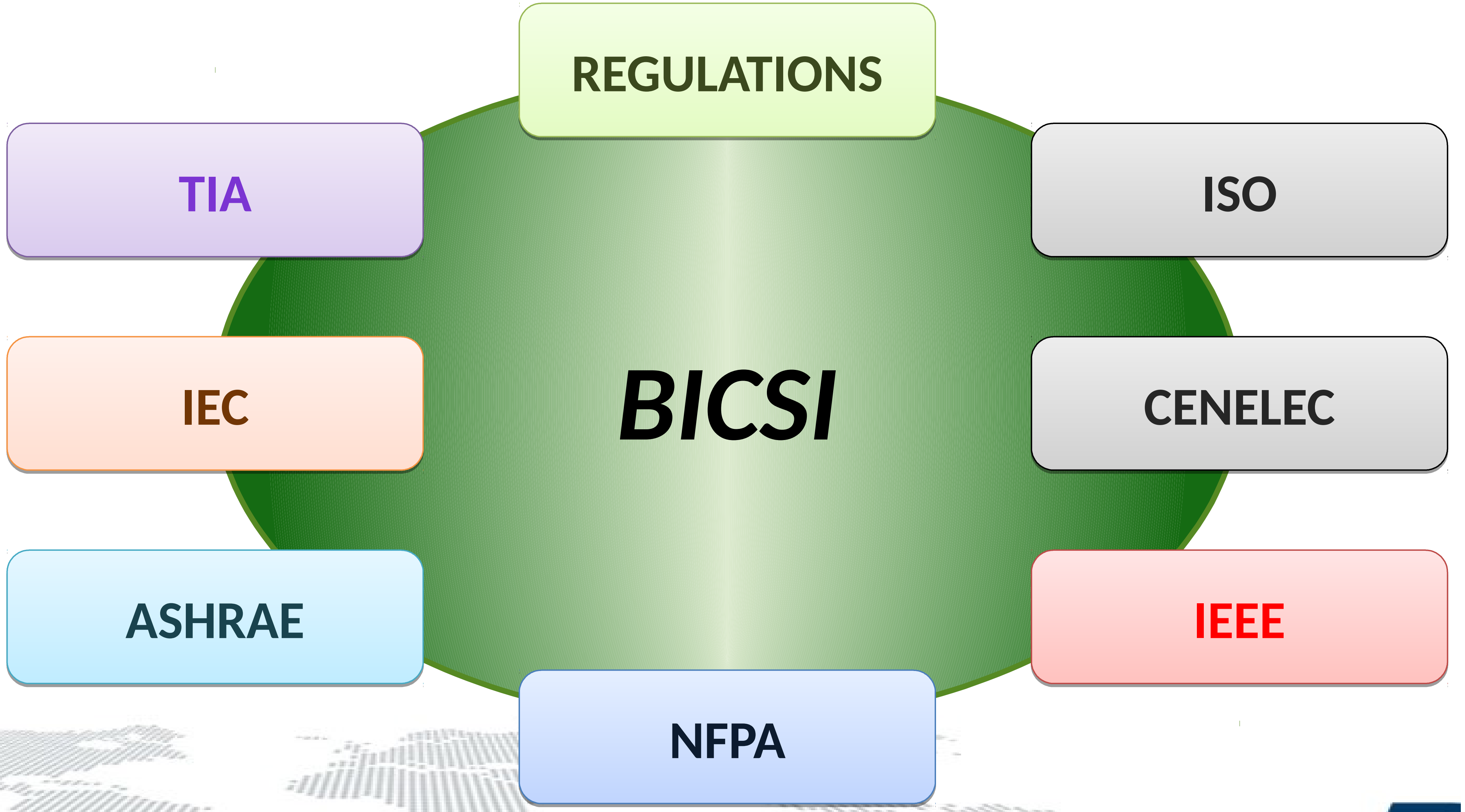
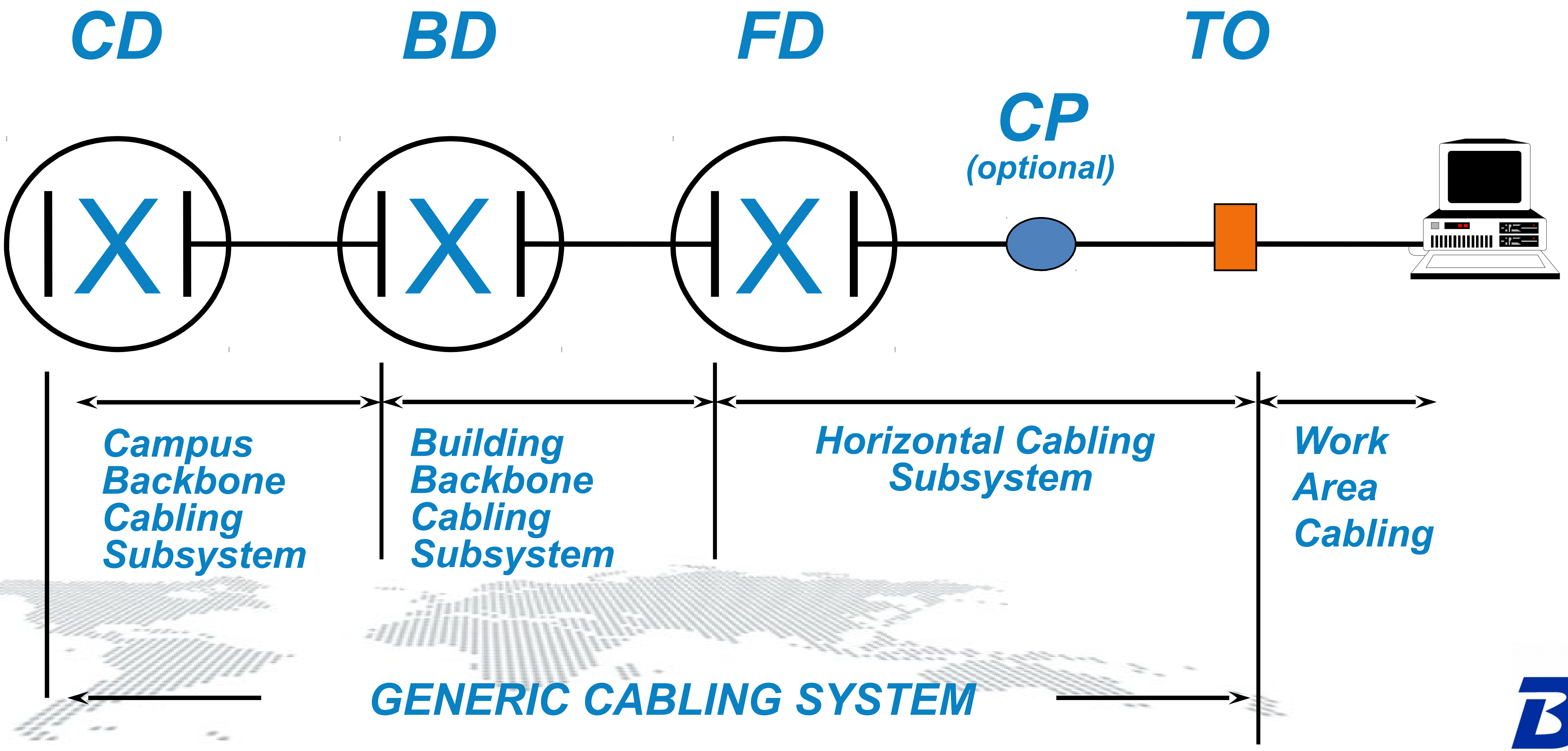
Standards



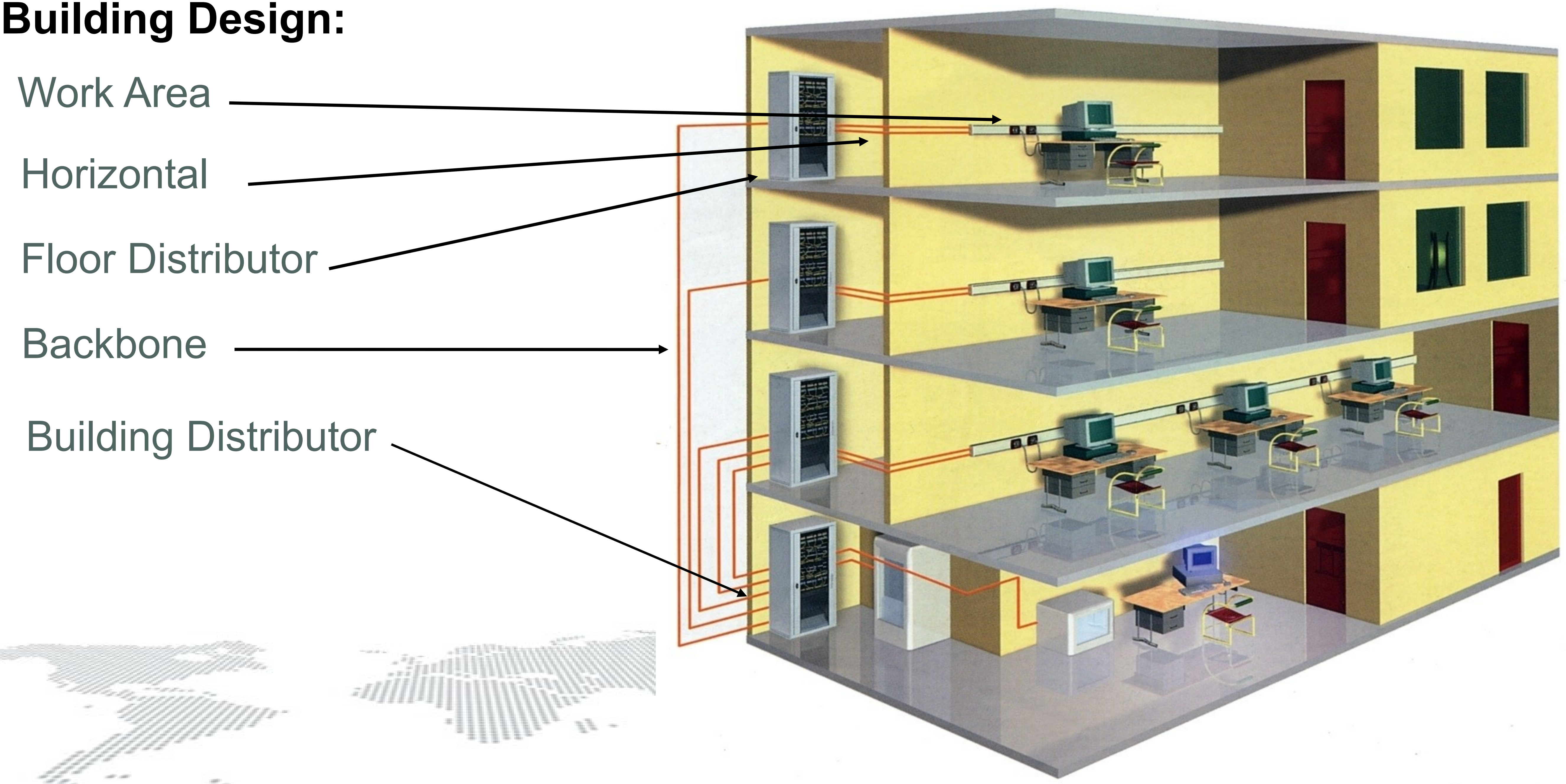
Star Topology

Generic cabling system:



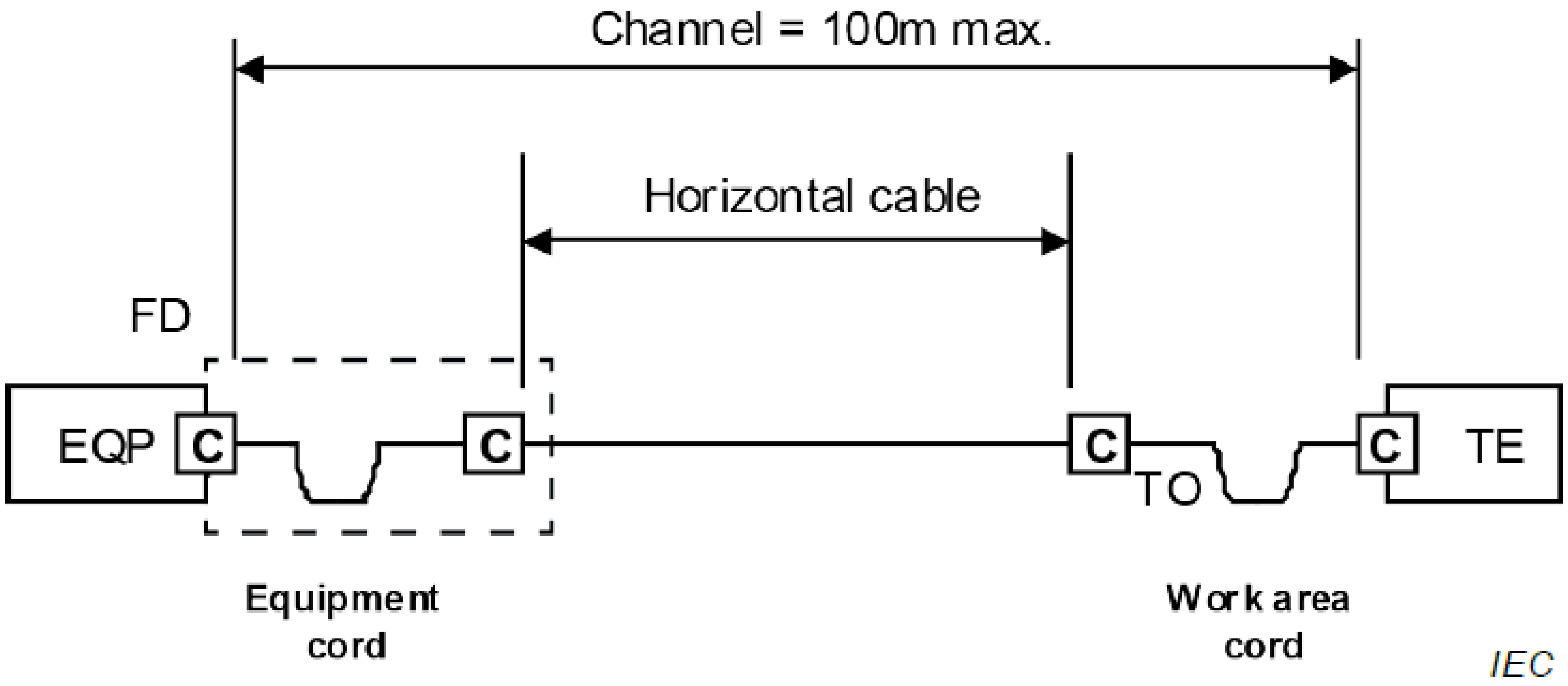
Star Topology

Typical Building Design:



Star Topology

Typical Horizontal Cabling:



a) Interconnect - TO model

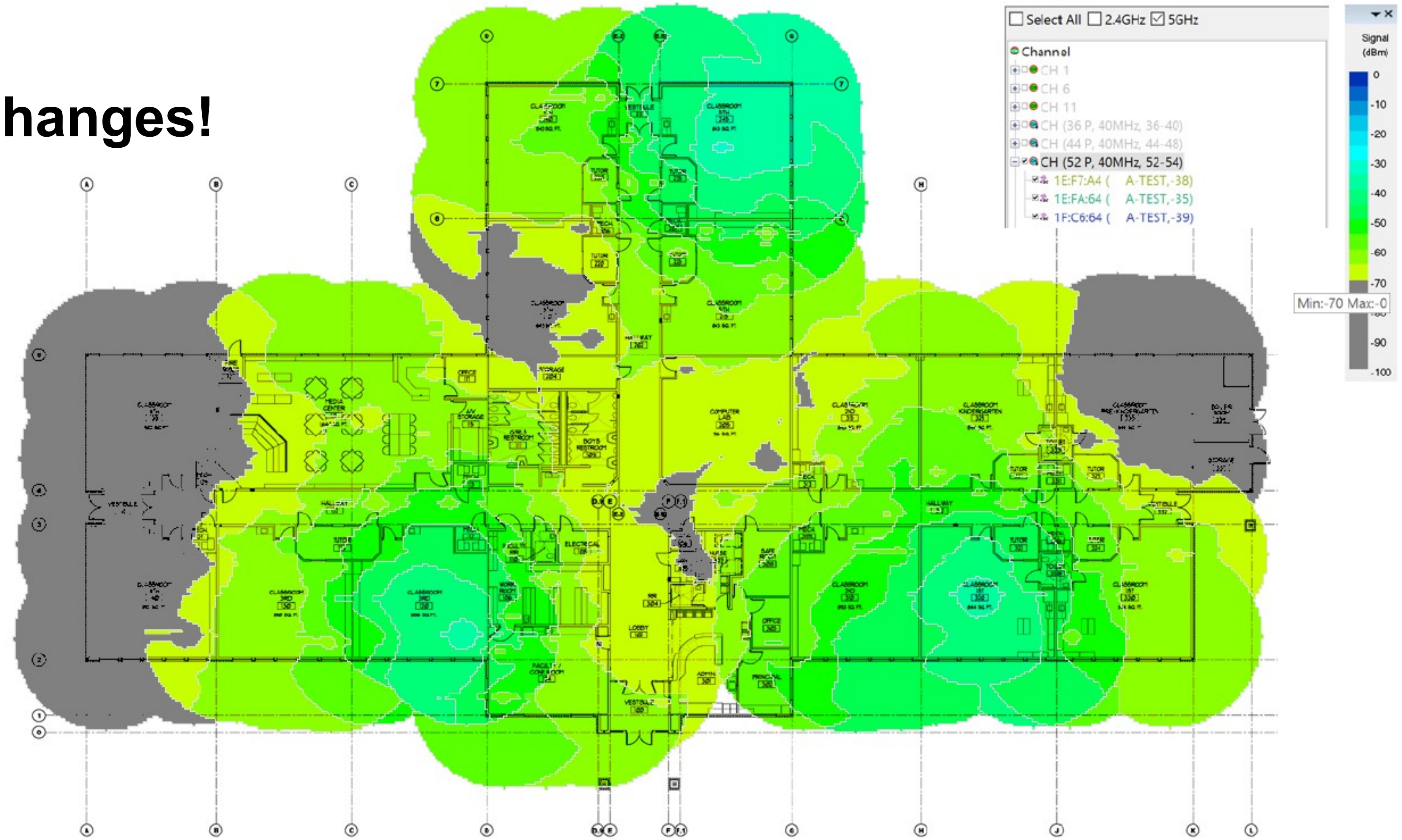
ISO/IEC 11801-2 2017, horizontal cabling models

Cabling for Wireless Access Points

Cabling for wireless access points:

- The traditional method is a site survey.
- To then define position of access points.
- And then install cabling.
- This allows almost no possibility for future changes!
  - Office converted to meeting room
  - New metallic furniture
  - …

BICSI 008: Wireless LAN design



gray areas indicate signal strength is below desired levels

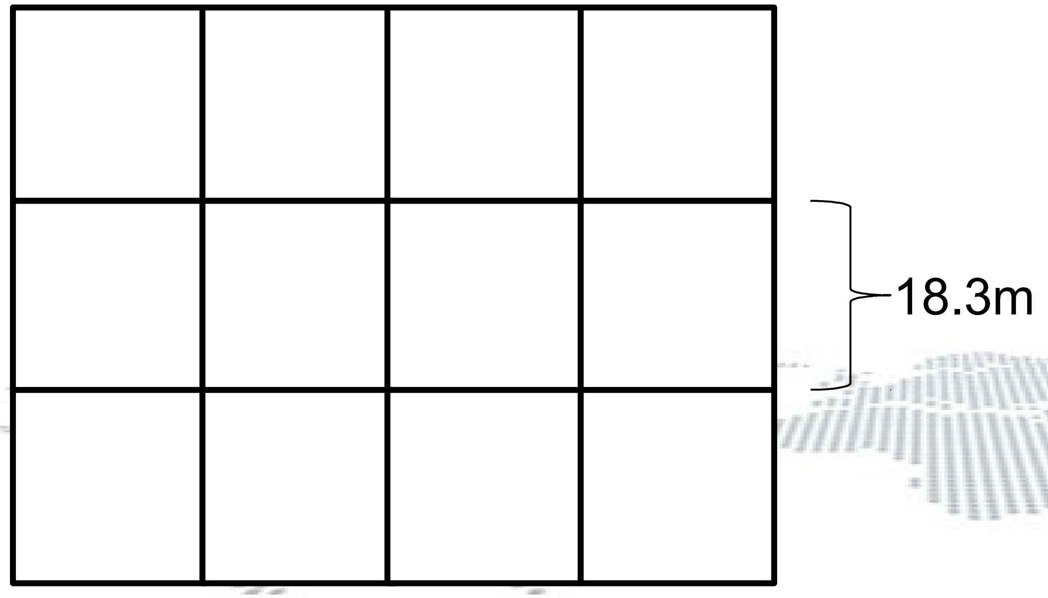
Figure 6-3

Cabling for Wireless Access Points

Cabling for wireless access points:

- Cabling standards created for cabling independent of position of the access points.
- SO = Service Outlet
  - 2 ports minimum
  - Cat6a minimum

TIA-TSB-162-A



ISO / IEC TR 24704

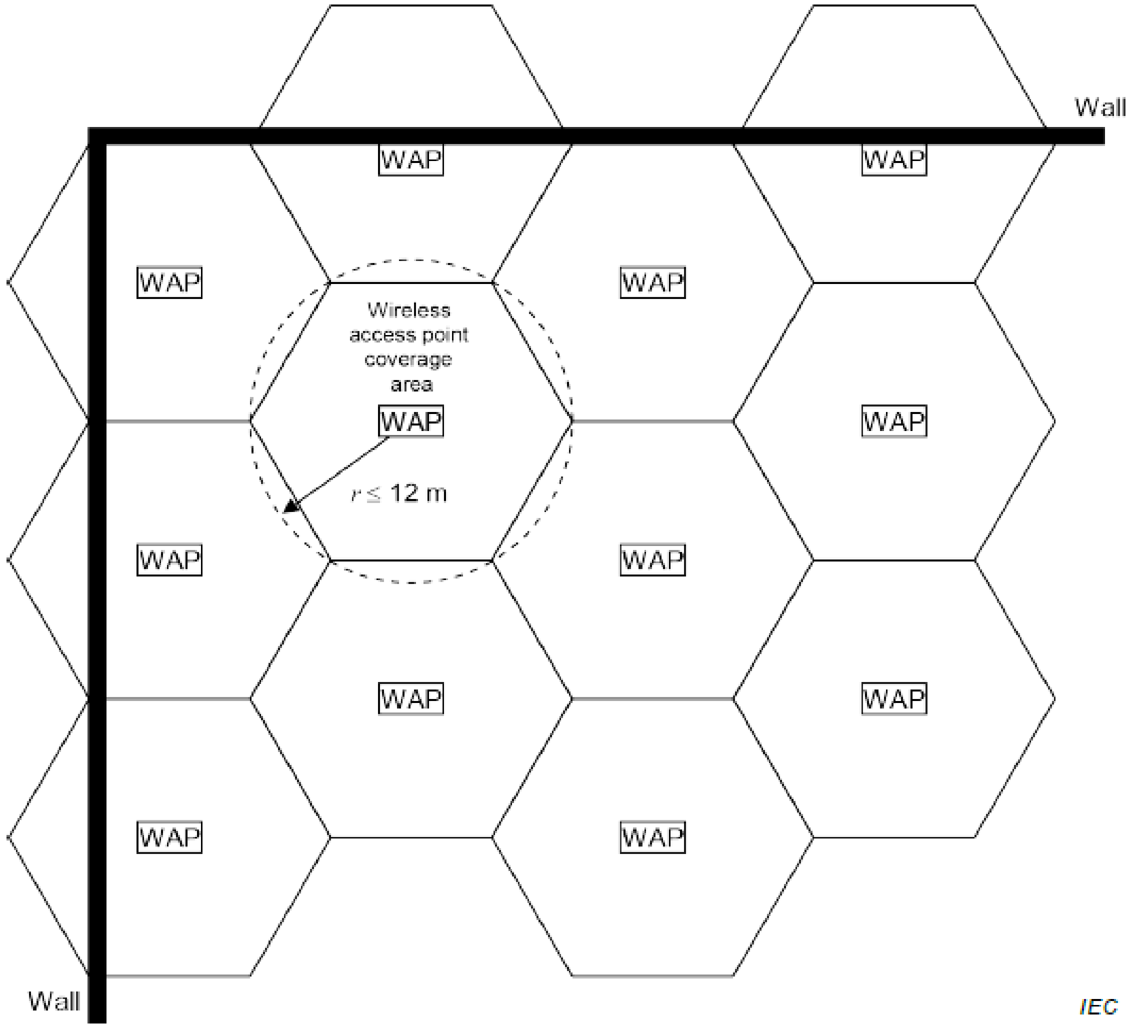
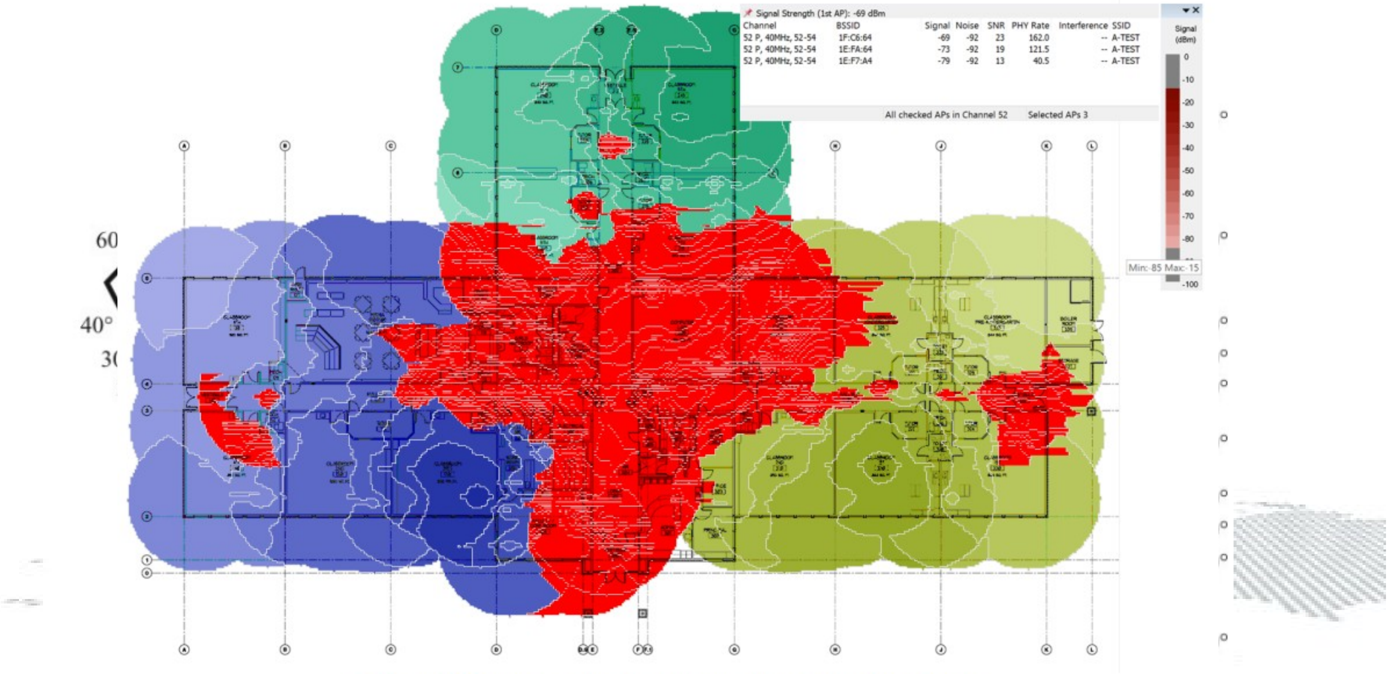


Figure A.1 – Wireless application coverage area grid

Cabling for Wireless Access Points

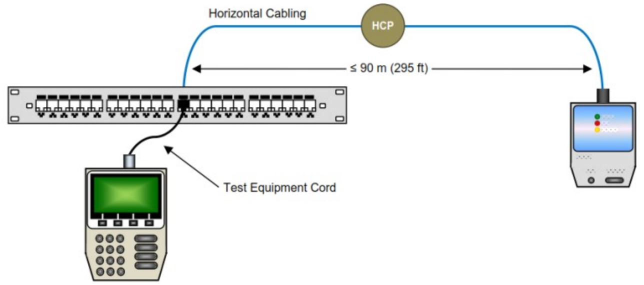
The BICSI 008:

- Regulatory and safety.
- WLAN Systems
- WLAN Cabling Infrastructure Design
- Wireless System Implementation
- Site and Functional Considerations

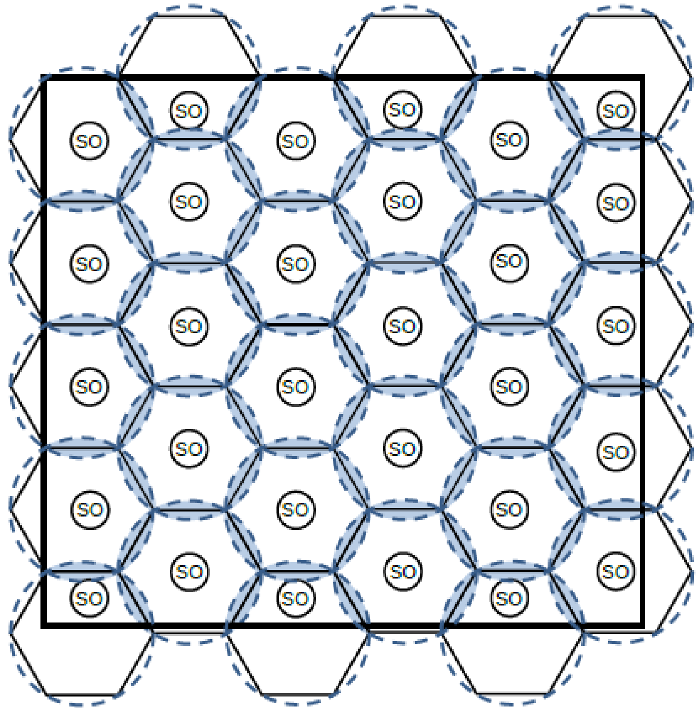


red areas indicate unacceptable amounts of co-channel interference

Figure 6-4
Heatmap Showing Channel Overlap of 3 APs



BICSI 008: Wireless LAN design



Note: Device coverage areas are shown to illustrate the square or hexagonal shapes used within cabling infrastructure planning that will support device coverage and placement needs. Actual device coverage areas and overlap will vary depending on final placement of WLAN devices based on WLAN design factors.

Figure 7-5
Example of Square and Hexagonal Service Outlet Coverage Area Patterns with Circular Device Coverage Areas Shown

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ISO / IEC 11801-6: Distributed building services

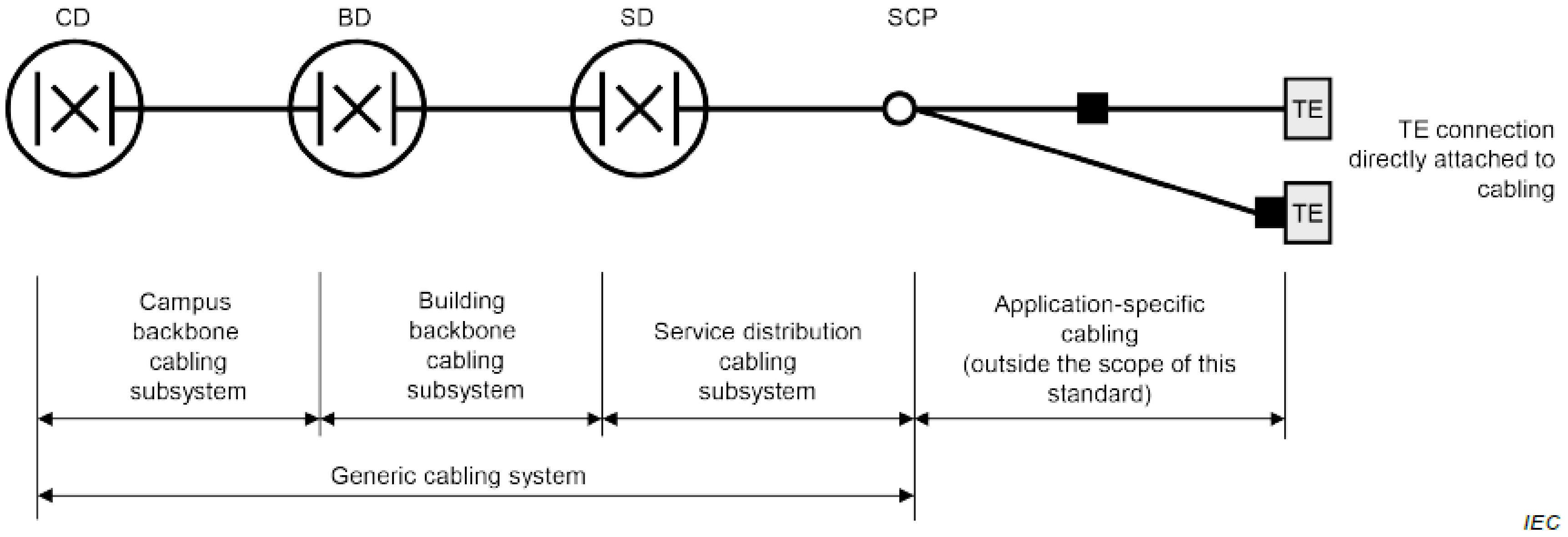


Figure 4 – Structure of Type B generic cabling

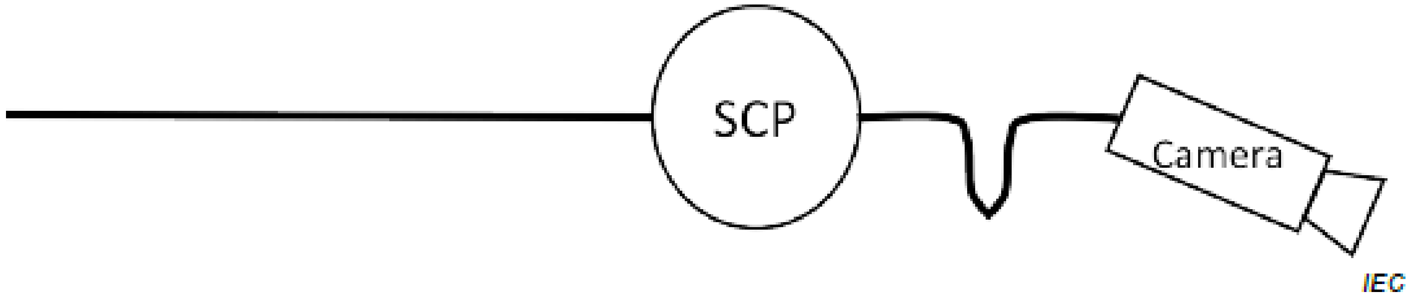
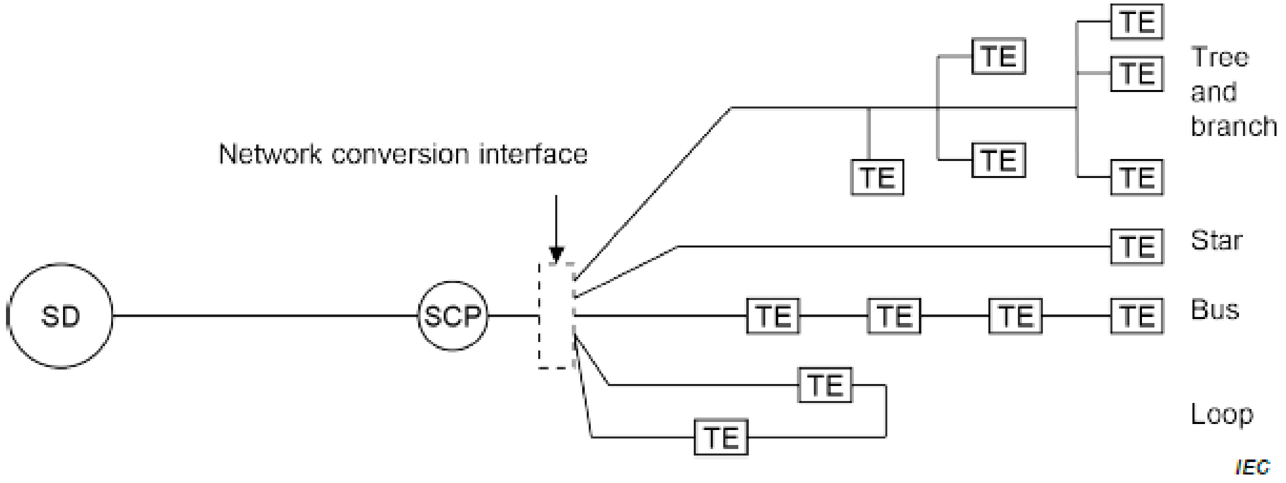


Figure 7 – Cabling without the use of an SO



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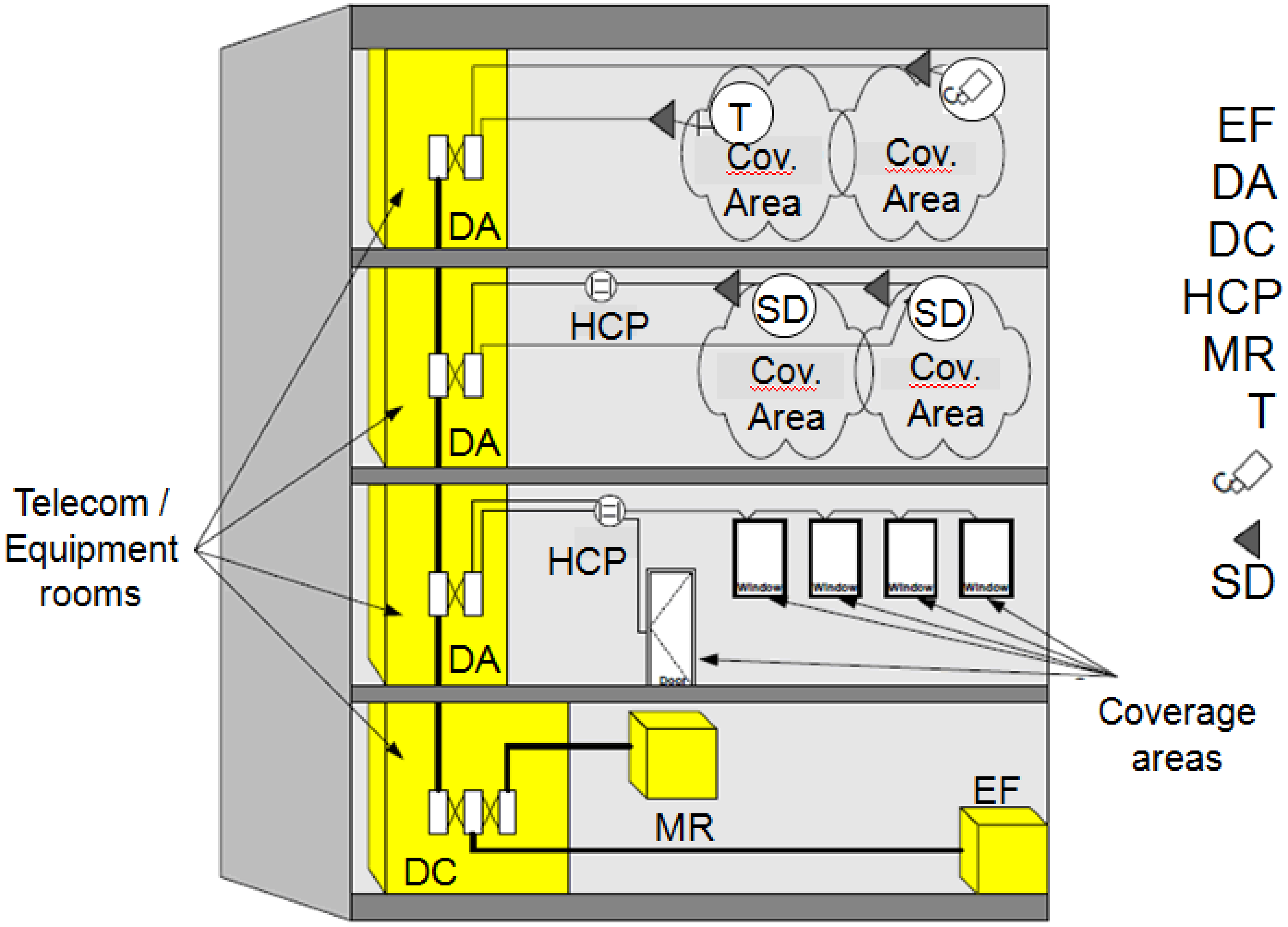
ANSI / TIA 862-B: Structured Cabling for Intelligent Building Systems



EF Entrance Facility
DA Distributor A
DC Distributor C
HCP Horizontal Conn. Point
MR Mechanical Room
T Thermostat
Camera
Equipment Outlet
SD Smoke Detector

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BICSI 007: ICT Design for Intelligent Buildings and Premises

Various uses for the Service Outlets

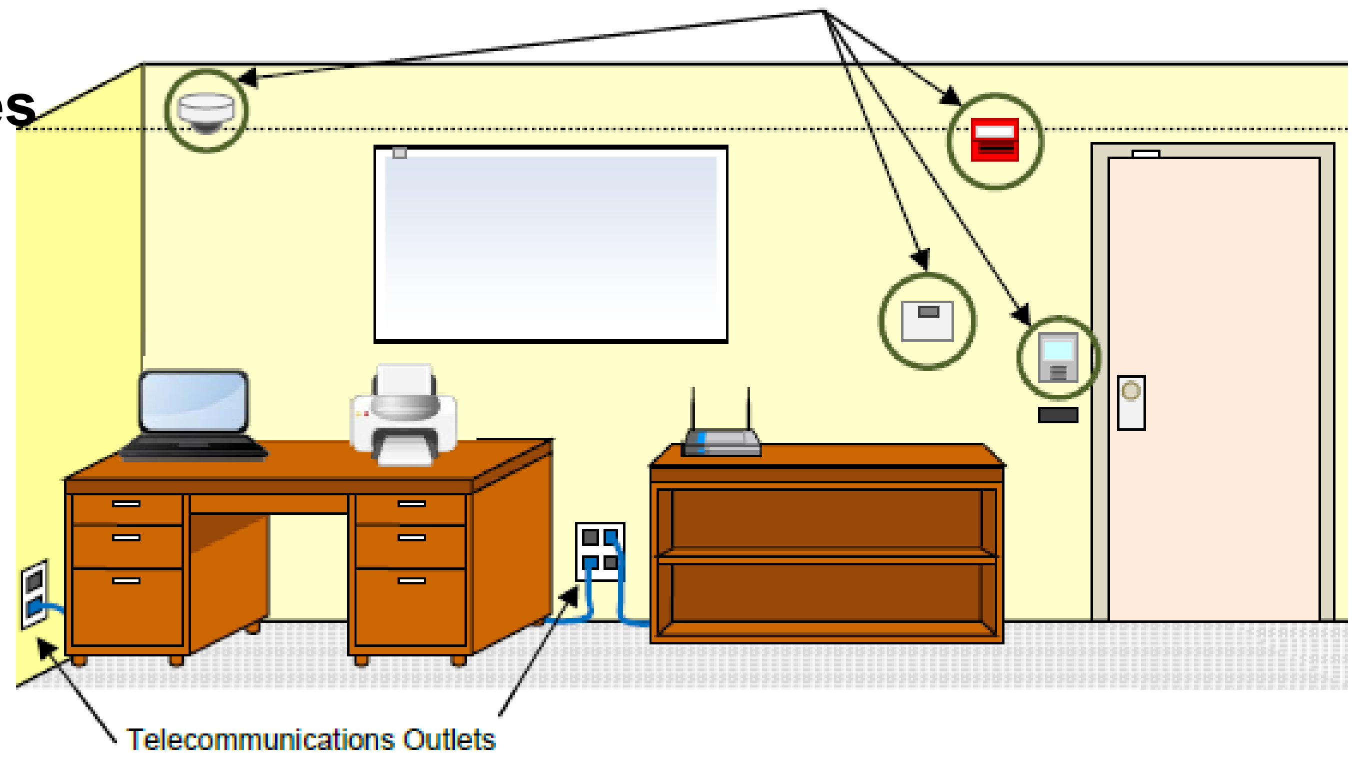

Figure 5-7
Types of Outlets Within a Building

5.6 Outlets and Connectors

5.6.1 Overview

Outlets and their corresponding connectors provide the ability to easily connect equipment (e.g., computer, phone, security camera, wireless access point) to the ICT cabling system. A common example is a wall mounted connector within an outlet in which a cable or equipment cord for a telephone is inserted.

Outlets can be defined into the following two categories:

- Telecommunications outlet—used primarily in locations where the end device is administered by the user (e.g., computer, phone)
- Service outlet (SO)—connects a "non-telecommunications" device (e.g., door controller, security camera), and its location, media and topology is dependent on the application and location of the service.

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BICSI 007:

Methods of connection

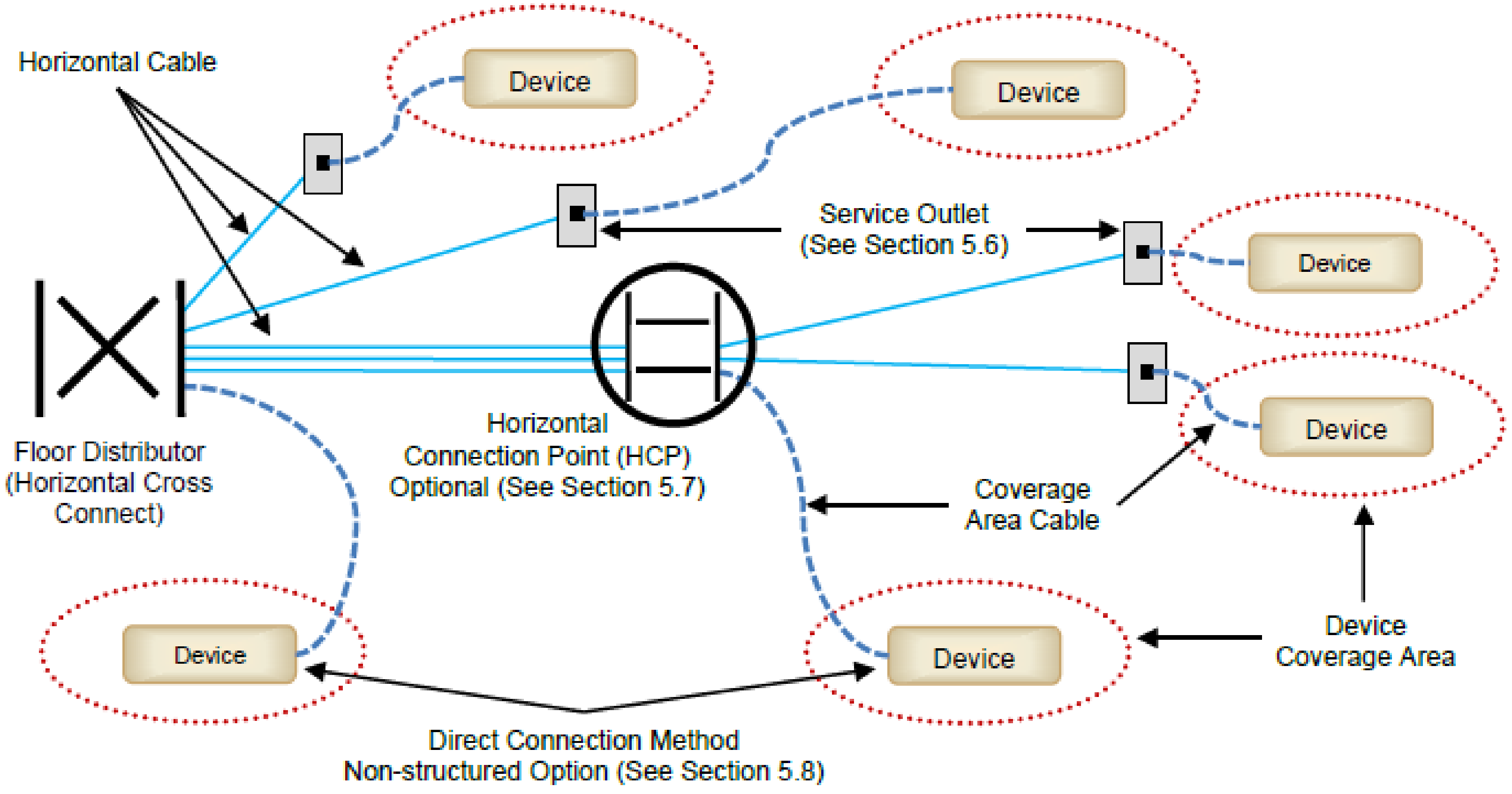

Figure 5-6
Building System Horizontal Cabling Elements within a Star Topology

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BICSI 007:

Explanation of the HCP (SCP)

5.7 Horizontal Connection Point (HCP)

NOTE: A service concentration point (SCP), as defined in ISO/IEC ISO11801-6, is analogous to a horizontal connection point. The requirements and recommendations of this section are applicable, except where otherwise noted.

5.7.1 Introduction

An HCP is a connection point within the horizontal cabling between the TR and the corresponding building service outlet or device, and is analogous to the consolidation point used within communication and data networks. HCPs often are the most efficient solution in areas where there is a high density of building system connections.

Figure 5-6 shows an example of an HCP implemented within horizontal cabling. HCPs are commonly used within zone cabling design, as the use of an HCP reduces the length of cable that may need to be pulled or changed as devices are added, moved, or removed. For most building systems, an HCP may be configured as an interconnect (i.e., one patch panel or connecting block) or a cross-connect (i.e., two patch panels or connecting blocks).

Figure 5-8 shows and example of an interconnect HCP mounted inside a ceiling enclosure.

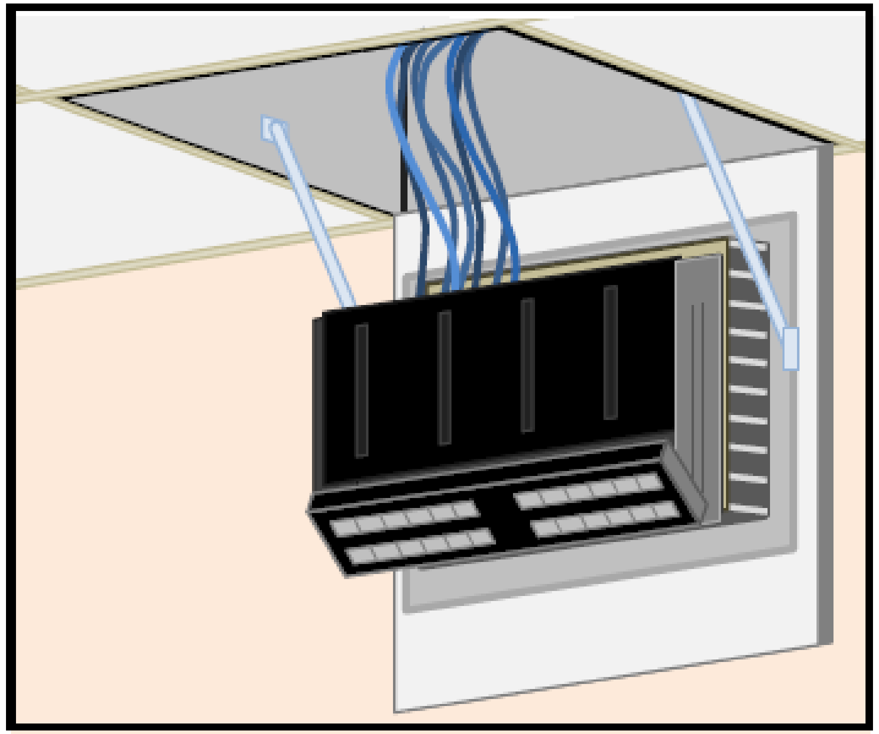

Figure 5-8
Example of an HCP Mounted in a Ceiling Enclosure

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BICSI 007:

How to position the HCPs (SCPs)?

6.1.3 Service Outlet Coverage Area Zones

For SO coverage areas within 17 m (50 ft) of a TR, a connection point is not required, as cabling may be routed directly from the TR. For SO coverage areas further than 17 m (50 ft), the use of a HCP is recommended to consolidate cabling from the TR to near the SO coverage area. When HCPs are used, a HCP can typically serve 4-5 SO coverage areas, which creates a zone. Figure 6-2 illustrates both a grid and hexagonal pattern divided into zones with HCPs and service outlets shown.

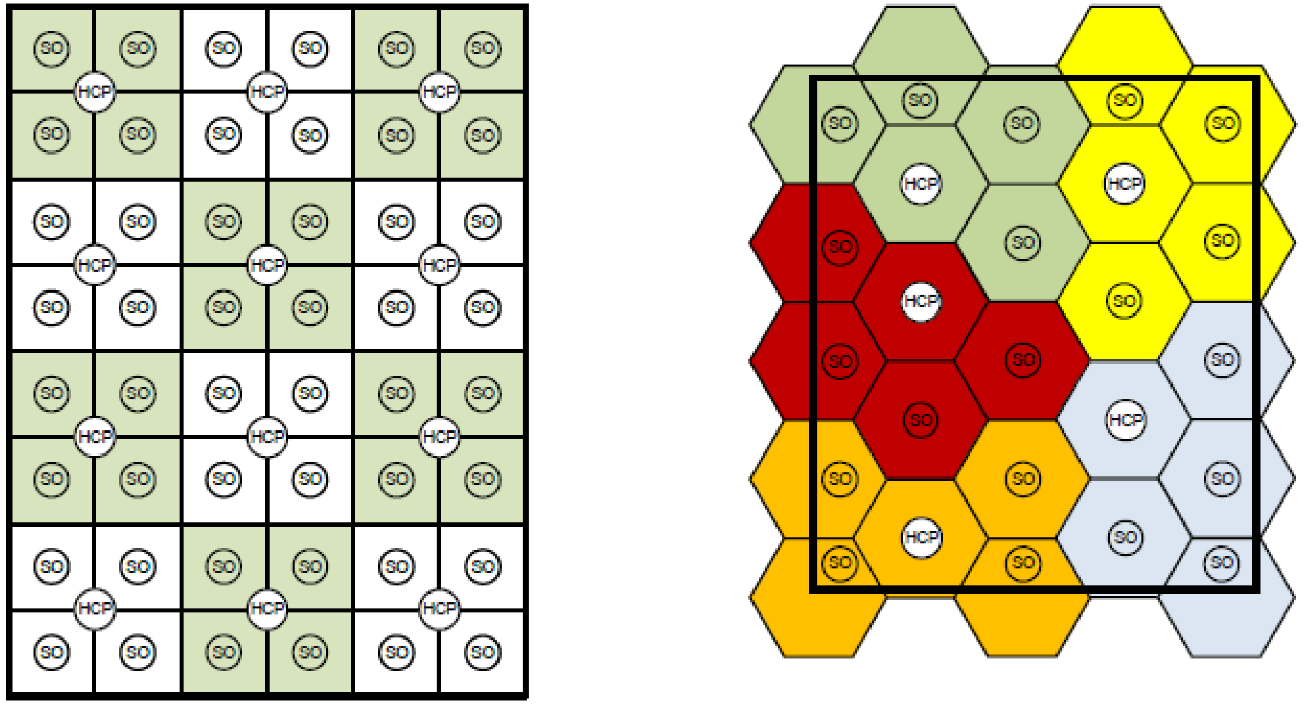

Figure 6-2
Example of Grid and Hexagonal Pattern Coverage Area Zones

The total number of SO coverage areas that can be served by a connection point is dependent on the number of devices that will be served. For example, in areas with a limited number of devices or for connection points dedicated to one type of device (e.g., WAPs), a connection point may be able to serve up to seven or eight coverage areas.

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BICSI 007:

- **Uses of PoE**

Table 6-2 PoE and HDBaseT Power Specifications

Transmission Method	*Power at Source (W)*	*Maximum Current per Conductor (A)*	*Notes*
PoE Type 1	15.40	0.175	IEEE 802.3af, uses two pairs to transmit power
PoE + Type 2	30	0.3	IEEE 802.3at, uses two pairs to transmit power
PoE ++ Type 3	60	0.3	IEEE 802.3bt, uses all pairs to transmit power
PoE ++ Type 4	100	0.5	IEEE 802.3bt, uses all pairs to transmit power
HDBaseT	100	0.5	HDBaseT 1.0 and HDBaseT 2.0 have the same power specifications. Also known as POH (power over HDBaseT)

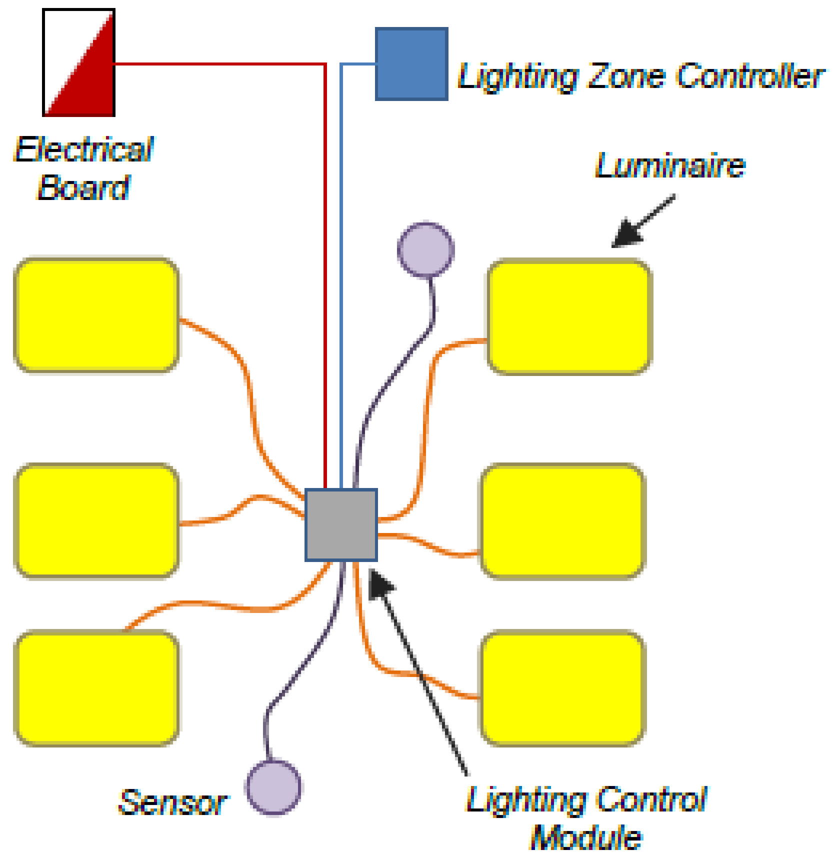

Figure 8-1
Modular LCM Lighting Control Topology

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BICSI 007:

- **Structured Cabling for lighting.**

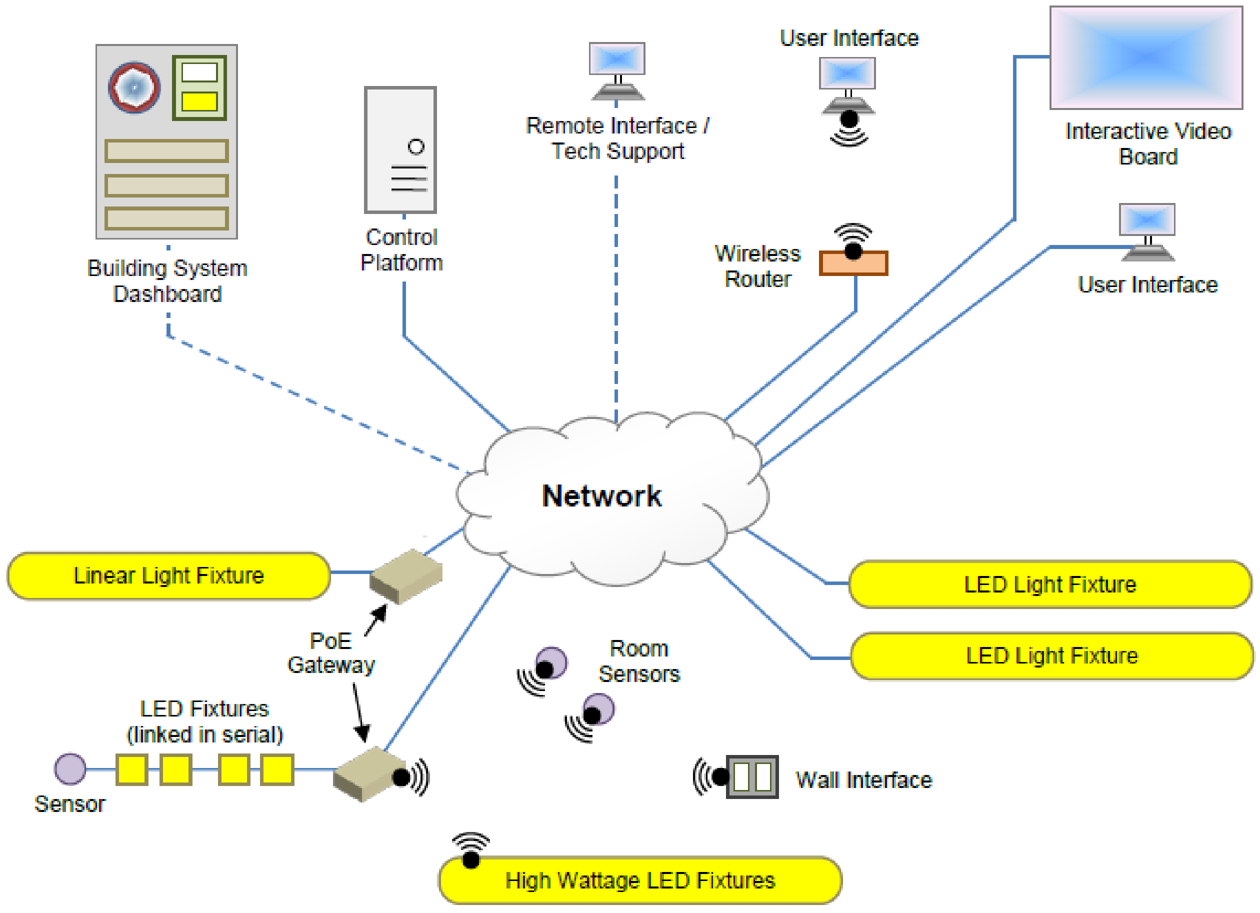

Figure 8-3
DC Lighting Power Supply and Control Topology

8.2.2.4 Extra Low Voltage Lighting Control

8.2.2.4.1 Overview

LED lights consume much less energy than other types of lamps so it becomes possible to connect them using extra low voltage DC current from a central controller using PoE or other methods. The advantages of this topology (see Figure 8-3) include installation cost savings relating to cabling because the category cables are used for power and control, and in many locations are not subject to regulations applicable to mains power voltages (e.g., 120, 230, or 277 V_{AC}). Disadvantages include that all light fixtures must be fitted with a controller compatible with the proprietary network protocol and sensors must also be compatible.

Cabling may be brought back to the same floor distributor as other intelligent building systems, data and telephony and separated at the patch field. Cable terminations at the light fixtures are unlikely to be changed for other uses, so these may terminate with a modular plug (e.g., RJ-45) for connection directly to the LED controller.

Interfaces with other systems together with user control and monitoring is normally by an IP network connection to the matrix controller. Lighting controls ease the interfacing with other systems, as each light fixture becomes a network port and are able to provide switching, dimming and other advanced features such as color changes of the LED's.

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BICSI 007:

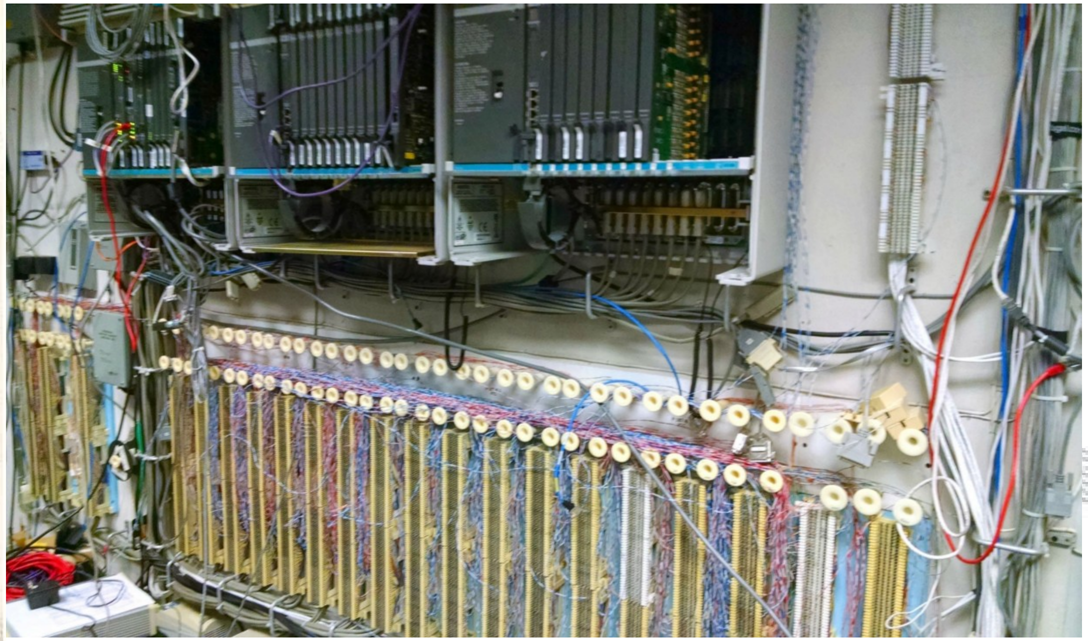
- **The Intelligent Building cabling is about ensuring that all systems can be integrated.**
- **The BICSI 007 explains how to implement**

9 Other Building Systems ....
9.1 Digital Signage and Wayfinding................
9.1.1 Overview ....
9.1.2 Digital Displays ....
9.1.3 Usage Conditions...................................
9.1.4 Design Considerations...........................
9.1.5 Wayfinding Recommendations ....
9.2 Sound and Acoustical Systems ....
9.2.1 Purposes of Sound Systems:...................
9.2.2 Sound Systems.......................................
9.2.3 Sound System Design Conditions: ....
9.2.4 Integration..
9.2.5 Code and AHJ Requirements.................
9.3 Intercom System ....
9.3.1 Overview ....
9.3.2 Components..
9.3.3 Operation ....
9.3.4 Integration...
9.4 Electronic Safety and Security Systems....
9.4.1 Overview ....
9.4.2 Requirements..
9.5 Real Time Location Systems (RTLS) ....
9.5.1 Overview ....
9.5.2 Active and Passive Systems...................
9.5.3 Common Methods of Transmission........
9.5.4 Uses ....

The place for BICSI

Structured cabling evolves.

- Our world is changing. So is our ICT infrastructure, becoming a digital infrastructure.
- The ANSI/TIA, ISO/IEC, CENELEC and other national standards will continue to adapt and provide minimum requirement for inter-operability
- BICSI standards provide the global understanding of all aspects.



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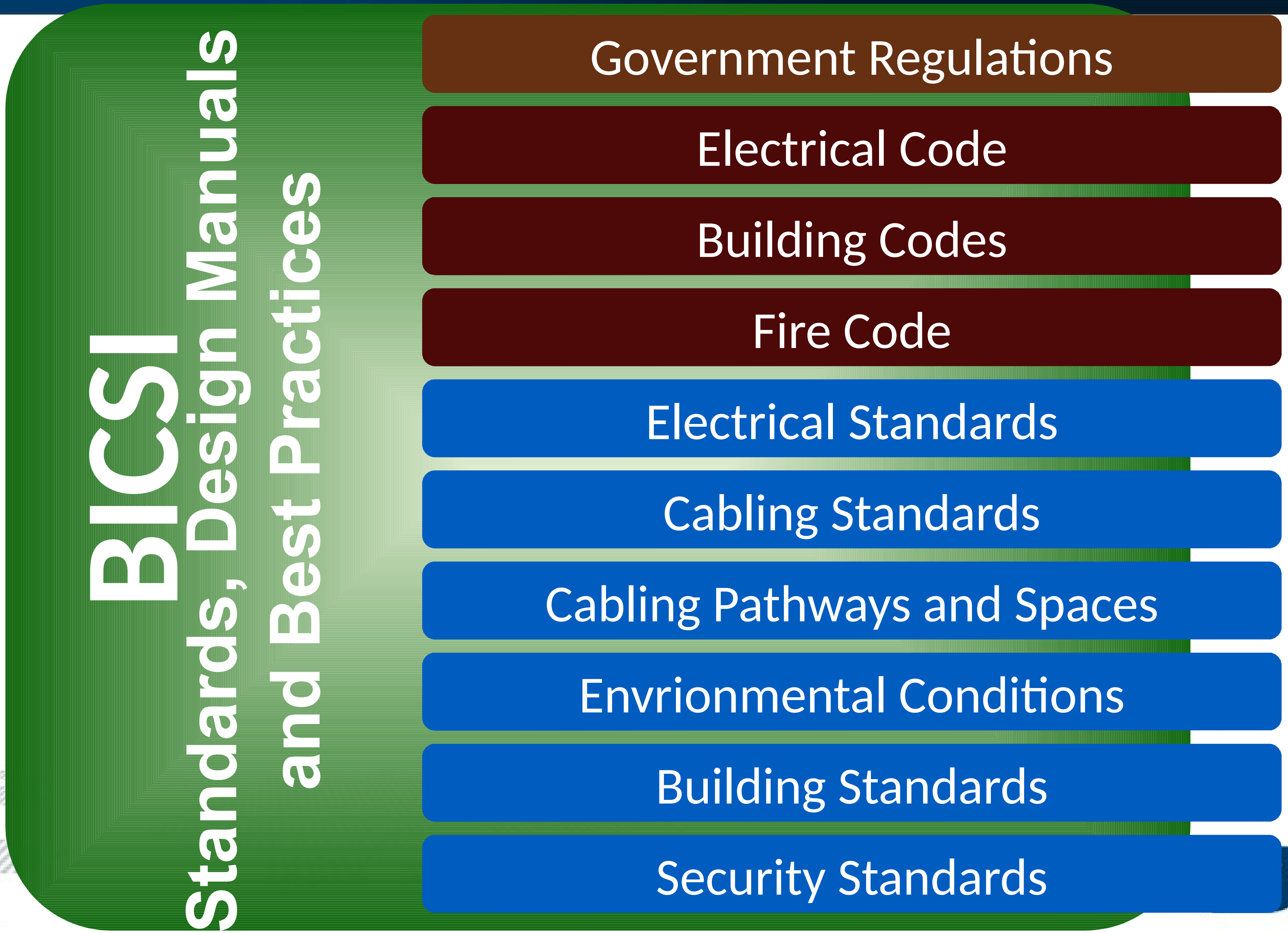
Interoperability



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Thank You

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